

# Notice of Allowability

Application No.

10/749,518

Applicant(s)

ABE ET AL.

Examiner

Art Unit

Robert M. Timblin

2167

## -- The MAILING DATE of this communication appears on the cover sheet with the correspondence address--

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. ☒ This communication is responsive to Communications of 4/12/2007.
2. ☒ The allowed claim(s) is/are 23-48 now renumbered 1-26.
3. ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
  - a) ☐ All    b) ☐ Some\*    c) ☐ None    of the:
  1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

\* Certified copies not received: \_\_\_\_\_.

Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application.

**THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.**

4. ☐ A SUBSTITUTE OATH OR DECLARATION must be submitted. Note the attached EXAMINER'S AMENDMENT or NOTICE OF INFORMAL PATENT APPLICATION (PTO-152) which gives reason(s) why the oath or declaration is deficient.
  5. ☐ CORRECTED DRAWINGS (as "replacement sheets") must be submitted.
    - (a) ☐ including changes required by the Notice of Draftsperson's Patent Drawing Review (PTO-948) attached
      - 1) ☐ hereto or 2) ☐ to Paper No./Mail Date \_\_\_\_\_.
    - (b) ☐ including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No./Mail Date \_\_\_\_\_.
- Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).
6. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

### Attachment(s)

1. ☐ Notice of References Cited (PTO-892)
2. ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3. ☐ Information Disclosure Statements (PTO/SB/08),  
Paper No./Mail Date \_\_\_\_\_
4. ☐ Examiner's Comment Regarding Requirement for Deposit  
of Biological Material
5. ☐ Notice of Informal Patent Application
6. ☐ Interview Summary (PTO-413),  
Paper No./Mail Date \_\_\_\_\_
7. ☒ Examiner's Amendment/Comment
8. ☒ Examiner's Statement of Reasons for Allowance
9. ☐ Other \_\_\_\_\_

### **DETAILED ACTION**

This Office Action corresponds to application 10/749,518. Claims 23-48 have been allowed.

#### ***Response to Amendment***

Applicant's amendments submitted 4/12/2007 obviate the previous 35 USC 112 rejections. Accordingly, the rejections have been removed.

#### ***Response to Arguments***

Applicant's arguments see pages 10-11 of the response, filed 4/12/2007, with respect to claim 23 have been fully considered and are persuasive. The 35 USC 112 rejection of claim 23 has been withdrawn.

#### **Examiner's Amendment**

An examiner's amendment to the record appears below. Should the changes and/or additions be unacceptable to applicant, an amendment may be filed as provided by 37 CFR 1.312. To ensure consideration of such an amendment, it MUST be submitted no later than the payment of the issue fee.

Note in the following: Independent claims 23 and 36 have been amended to include "...at least a given minimum  $t$ " to further specify  $t$  as a minimum value given. Support can be found in the specification at page 7.

Authorization for this examiner's amendment was given in a telephone interview with Attorney Laurence E. Stein (Reg. No. 35,371) on 6/19/2007.

The following shall replace all previous versions of the claims:

23. A method of outlier detection comprising:

generating a plurality of synthesized data, each representing a randomly generated state within a given vector space, said generating including a random number generation;

receiving a plurality of real sample data, each representing a detected real event as represented in said given vector space;

forming a candidate sample set comprising a union of at least a part of said plurality of synthesized data and said plurality of real sample data, said candidate sample set having a starting population, said candidate sample set being unsupervised as to which members will be classified by said method as being outliers;

generating a set of classifiers, each member of said set being a procedure or a representation for a function classifying an operand data as an outlier or a non-outlier, said generating a set of classifiers including;

initializing said set of classifiers to be an empty set,

selectively sampling said candidate sample data to form a learning data set, said selectively sampling including:

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i) applying said set of classifiers to each of said candidate sample data and, if any classifiers are extant in said set, generating a corresponding set of classification results,

ii) identifying a consistency, for each of said candidate sample data, among said data's corresponding set of classification results,

iii) calculating an uncertainty value for each of said candidate sample data based on said identified consistency of said data's corresponding set of classification results,

iv) calculating a sampling probability value for each of said candidate sample data based, at least in part, on the corresponding uncertainty value based on said set of classification results, and

v) sampling from said candidate data to form said learning data set based, at least in part, on said sampling probability values, such that said learning data set has a population substantially lower than the starting population,

generating another classifier based on said learning data set,

updating said set of classifiers to include said another classifier,

and

repeating said selectively sampling, said generating another classifier, and said updating until said set of classifiers includes at least a given minimum  $t$  members; and

generating an outlier detection algorithm based, at least in part, on at least one of said another classifiers, for classifying a datum as being an outlier or a non-outlier.

24. The method of claim 23, further comprising:

receiving a given mis-classifying cost data associated with at least one of said synthesized samples, representing a cost of said outlier detection algorithm mis-classifying said at least one synthesized sample as a non-outlier.

25. The method of claim 24, wherein said constructing said learning data set from said candidate sample data is further based on said mis-classifying cost.

26. The method of claim 23, wherein said calculating a probability of said identified consistency uses a Binomial probability function.

27. The method of claim 23, wherein said calculating a probability of said identified consistency uses a Gaussian probability function.

28. The method of claim 23, said generating synthesized data generates said synthesized data in accordance with a given statistical likelihood of said generated data meeting an outlier criterion.

29. The method of claim 23, wherein said generating an outlier detection algorithm generates the outlier detection algorithm such that said algorithm applies an aggregate of members of said set of classification algorithms, calculates a corresponding set of detection result data representing each of said aggregate's

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member's classification, and applies a voting scheme to said corresponding set of detection result data.

30. The method of claim 23, wherein said calculating a probability of said consistency assumes each classification result within said set has a 50-50 probability of representing an operand as meeting an outlier criterion, statistically independent of said operand and of all other classification results within said set.

31. The method of claim 30, wherein said calculating a probability of said identified consistency a Binomial probability function.

32. The method of claim 30, wherein said calculating a probability of said identified consistency uses a Gaussian probability function.

33. The method of claim 28, wherein said calculating a probability of said consistency assumes each classification result within said set has a 50-50 probability of representing an operand as meeting said outlier criteria, statistically independent of said operand and of all other classification results within said set.

34. The method of claim 33, wherein said calculating a probability of said identified consistency uses a Binomial probability function.

35. The method of claim 33, wherein said calculating a probability of said identified consistency uses a Gaussian function.

36. A system for classifying externally detected samples as one of at least normal and an outlier, comprising:

- a machine controller having a readable storage medium;

- a machine-readable program code, stored on the machine-readable storage medium, having instructions to:

- generate a plurality of synthesized data, each representing a randomly generated state within a given vector space, said generating including generating a random number;

- receive a plurality of real sample data, each representing an observed event as represented in said given vector space;

- form a candidate sample set comprising a union of at least a part of said plurality of synthesized data and said plurality of real sample data, said candidate sample set having a starting population;

- generate a set of classifiers, each member of said set being a procedure or a representation for a function classifying an operand data as an outlier or a non-outlier, said generating a set of classifiers including:

- initializing said set of classifiers to be an empty set,

- selectively sampling said candidate sample data to form a learning data set, said selectively sampling including:

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i) applying said set of classifiers to each of said candidate sample data and, if any classifiers are extant in said set, generating a corresponding set of classification results,

ii) identifying a consistency, for each of said candidate sample data, among s

aid data's corresponding set of classification results,

iii) calculating an uncertainty value for each of said candidate sample data based on said identified consistency of said data's corresponding set of classification results,

iv) calculating a sampling probability value for each of said candidate sample data based, at least in part, on the corresponding uncertainty value based on said set of classification results, and

v) sampling from said candidate data to form said learning data set based, at least in part, on said sampling probability values, such that said learning data set has a population lower than the combined first and second population, generating another classifier based on said learning data set, updating said set of classifiers to include said another classifier, and

repeating said selectively sampling, said generating another classifier, and said updating until said set of classifiers includes at least a given minimum  $t$  members; and



to generate an outlier detection algorithm based, at least in part, on at least one of said another classifiers, for classifying a datum as being an outlier or a non-outlier as rules for determining outliers.

37. The method of claim 36, wherein said machine readable program code further comprises instructions for:

receiving a given mis-classifying cost data associated with at least one of said example abnormal state data, said cost data representing a cost of said outlier detection algorithm mis-classifying a data equal to said abnormal state data as not meeting an outlier criterion.

38. The system of claim 36, wherein said machine-readable code instructions constructing said learning data set from said candidate sample data include instructions for constructing said learning data based, at least in part, on said mis-classifying cost.

39. The system of claim 36, wherein said machine-readable code instructions for calculating a probability of said identified consistency include instructions for calculating said probability using a Binomial probability function.

40. The system of claim 36, wherein said machine-readable code instructions for calculating a probability of said identified consistency include instructions for calculating said probability using a Gaussian probability function.

41. The system of claim 36, wherein said machine-readable code instructions for generating synthesized data include instruction for generating said data in accordance with a given statistical likelihood meeting an outlier criterion.

42. The system of claim 36, wherein said machine-readable code instructions for generating the outlier detection algorithm include instructions such that said algorithm applies an aggregate of members of said set of classification algorithms, calculates a corresponding set of detection result data representing each of said aggregate's member's classification, and applies a voting scheme to said corresponding set of detection result data.

43. The system of claim 36, wherein said machine-readable code instructions for calculating said uncertainty value include instructions that assume each classification result within said set has a 50-50 probability of representing an operand as meeting an outlier criterion, statistically independent of said operand and of all other classification results within said set.

44. The system of claim 36, wherein said machine-readable code instructions for calculating a probability of said identified consistency include instructions for calculating said probability using a Binomial probability function.

45. The system of claim 36, wherein said machine-readable code instructions for calculating a probability of said identified consistency include instructions for calculating said probability using a Gaussian probability function.

46. The system of claim 41, wherein said machine-readable code instructions for calculating of said uncertainty value include instructions that assume each classification result within said set has a 50-50 probability of representing an operand as meeting said outlier criterion, statistically independent of said operand and of all other classification results within said set.

47. The system of claim 45, wherein said machine-readable code instructions for calculating a probability of said identified consistency include instructions for calculating said probability using a Binomial probability function.

48. The system of claim 45, wherein said machine-readable code instructions for calculating a probability of said identified consistency include instructions for calculating said probability using a Gaussian probability function.

**Conclusion**

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Robert M. Timblin whose telephone number is 571-272-5627. The examiner can normally be reached on M-F 8:00-4:30.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, John R. Cottingham can be reached on 571-272-7079. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

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6/20/2007

  
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